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Some North American Botanists.

V. JACOB BIGELOW.

To the older botanists of New England the name of Jacob Bigelow early became a household word. His botanical work was done at a time when there was no professedly complete manual of the plants of the Eastern States in existence, and when no local floras of any extent had been compiled. The only scientific contribution toward a knowledge of the plants of New England was the catalogue published in 1785 by the learned and energetic Manasseh Cutler. The flora of Michaux was too general and ill-adapted for use as a practical manual. Marshall's Arbustum Americanum, which appeared in 1786, was little more than an annotated alphabetical catalogue of trees and shrubs, the most of which grew in Pennsylvania. The other contributions to a knowledge of American botany accessible to Northern students when Bigelow began to write, were nothing more than a few local catalogues and scattered articles in various publications, unless, indeed, we accept Prof. B. S. Barton's work on Elementary Botany, which appeared in 1803, and which, if it had little scientific merit, could at least claim the honor of being the first American text-book. With this meagre literature Jacob Bigelow began his botanical labors. He had been raised a farmer's boy, educated at Harvard, whence he graduated with honors, and had, in 1810, begun the practice of medicine in Boston. For some time young Bigelow was much exercised as to the choice of a profession, the college graduates of that day being limited to the three "learned professions," divinity, law and medicine. His natural aversion to medicine was removed by the eloquence and enthusiasm of Dr. John Warren, who delivered a course of lectures at Harvard each year on the subject. By teaching school and by various other means he succeeded in graduating from the medical department of the University of Pennsylvania in 1810 in his twenty-third year. At this University he formed the ac-

quaintance of the gifted Prof. W. P. C. Barton, from whom he obtained, as he said, "the rudiments of a botanical taste which adhered to me for many years." This Professor Barton published several works on American botany, the most pretentious of which was the uncompleted "Flora of North America," begun in 1821. The first manifestations of a taste for botany had been experienced by young Bigelow long before this time, however. He often told his friends that from his earliest years he watched every plant and wondered over the variety of vegetable productions. He once laughingly said to a friend that his first lesson in botany was from the "most learned inhabitant of Sudbury" to whom he carried a Star of Bethlehem to ask its name. The "learned inhabitant" replied, "Why, that's grass."

Dr. Bigelow gained little pecuniary benefit from his "tin sign," as he used to call it, for the first year after his graduation. In 1811, he became associated with Dr. James Jackson, and for nearly sixty years ranked next to his venerable senior, the most popular practitioner of the city. In 1812 he began, with Professor W. D. Peck, of the University, a course of lectures on botany. These lectures at once became very popular, especially those delivered by Dr. Bigelow, who possessed a most happy manner of illustration quite unknown to his colleague. "Finding that a considerable taste had sprung up among my pupils for the study of plants," he says, "I began to collect materials for a description of the native plants of Boston and its vicinity, which I published in 1814 under the name of 'Florula Bostoniensis.'" This was a bright 12mo. of 268 pages, containing 294 genera. Most of the plants described grew within five or ten miles of Boston, and were collected during the two preceding seasons. It was arranged entirely upon the artificial system. To each plant was added a concise and popular description. The difficult genera were not well represented in this first edition, for the author had not had sufficient time for studying them closely. Nor were the limits of species as closely drawn then as now. In a subsequent edition of the flora he remarks, under Aster and Solidago, that "there are a vast variety of hybrids and subspecies which the labors of botanists have not yet been able to reduce under permanent characters, though names without number have been applied to fugitive varieties. In this work I have inserted only the more distinct or leading species, from which a great part of the others in this vicinity are probably descended." Florula Bostoniensis may be said to be the first distinctive local flora published in America. It passed through three editions, the sec-

ond of which was for some thirty years the leading manual of the plants of the North-eastern States. Although much of the contents were compiled, the short diagnoses must have been original. These short descriptions so beautifully expressed and so accurately drawn from the best characters of the plant, made his work most deservedly popular. Soon after the first edition was published he began, with Dr. Francis Booth, the collection of materials for a flora of New England. The mountains of Vermont and New Hampshire were diligently explored, and considerable progress was made in the proposed undertaking. In the meantime Dr. Bigelow had been made Professor of Materia Medica and Botany in Harvard University, and had also received the appointment of Rumford Professor of Technology. Some of the publications of Muhlenberg, Nuttall, Eaton, and Torrey had also appeared, and with his limited time and the increasing literature before the people, he decided to abandon the New England Flora. The results of his study and investigations are easily traced in the second edition of his Florula Bostoniensis, however, which appeared in 1824. During the ten years since the appearance of the first edition he had collected materials for the description of 26 new species, of which seven still stand in our manuals, Ceanothus ovalis, Juncus militaris, Stellaria borealis, Actæa alba, Lathyrus maritimus, Spiranthes gracilis and Myriophyllum tenellum. He also made a new genus, Bootia, founded upon the Potentilla arguta of Pursh. Although still retaining its modest title, this second edition was a virtual manual of New England botany, describing 455 genera and no less than 1200 species. It will be remembered that Carex and other difficult genera had received little attention at this time. It was not until after the second edition had appeared that Professor Dewey began his writings on Caricography. A third edition appeared in 1840, with 29 additional genera, but with the general body of the work remaining the same. This was the last work in this country arranged upon the artificial system. While realizing fully the advantages of the natural arrangement, he still desired to preserve the uniformity of his work, and therefore adhered to the old method.

During the years between 1814 and 1824 Dr. Bigelow did most of his botanical work. Some idea of the versatility and genius of the man may be formed from the facts that he was at the time holding two professorships, both of recent endowment, was one of the physicians of the Massachusetts General Hospital, was carrying on a large private practice, was preparing a work

on the medical plants of North America, was elaborating the list and nomenclature of the Materia Medica of the first edition of the United States Pharmacopœia, was a member of a number of scientific and literary societies to which he made frequent and elaborate contributions, was in correspondence with nearly all the leading botanists of Europe and America, and withal often turned his attention to poetry and Latin composition. He also brought out an edition of Sir J. E. Smith's Introduction to Botany. He was one of the very first, if not the first, in this country to make a scientific attempt toward a medical botany. The only works on that subject previous to his time appear to be Benjamin Franklin's edition of an English work by Dr. Short, with preface, notes and appendix by John Bartram, issued in 1751, and an "American Materia Medica," wholly in Latin, published in Europe in 1787 by Dr. Schoeff. Dr. Bigelow's "American Medical Botany" was published in three volumes, from 1817 to 1820. Each volume contained an extensive account of twenty species, each illustrated by a colored plate. The properties of many of these species had received chemical manipulation at his hands, and had been used in his private practice. His work upon the Materia Medica of the United States Pharmacopœia, which appeared in 1820, was characterized by a most laudable departure from the old systems of cumbrous nomenclature. In all possible cases he employed a single name for each drug in place of the double or triple names previously in use, a plan which is still followed in our National Pharmacopœia. He followed up this labor by publishing his practical treatise, long familiar to the profession under the name of "Bigelow's Sequel," a succinct, judicious and perspicuous commentary on the characters, qualities and uses of the remedies adopted by the national medical representatives.

Dr. Bigelow's leading characteristic was the versatility of his genius. He was not only a botanist, but one of the most skilled physicians of his time, and adept in mechanics and machinery, and a most polished classical scholar. His works upon medical topics are among the most important ever written. As in botany, so in medicine, he was a pioneer, but in the latter case a pioneer to inaugurate a most radical reform in the practices of his time. All his medical writings bear strong evidence of his lack of faith in drugs and heroic remedies, and in the reliance he placed upon the recuperative processes of nature. Indeed, his work upon "Self-limited Diseases" is an avowed attack upon the old methods.

O. W. Holmes asserts that "this remarkable essay has probably had more influence on medical practice in America than any similar brief treatise, we might say than any work ever published in this country. Its suggestions were scattered abroad at the exact fertilizing moment when public opinion was matured enough for their reception." But the reforms inaugurated by Dr. Bigelow were by no means confined to the overturning the heroic treatment of disease. His printed productions and addresses which record his progressive views on paramount themes of professional interest cover a period of more than half a century. Most of these writings are collected in two volumes, "Nature in Disease" and "Modern Inquiries." Dr. Bigelow was the first to fill the chair of Rumford Professor in Harvard College, a professorship endowed by the famous Count Rumford for the purpose of teaching the application of the sciences to the useful arts. He is said to have been so fond of mechanical studies that every workshop passed upon his walks, and every mechanic with whom he conversed, were made to yield some new treasure to his stock of information. He was familiar with nearly every trade and nearly every mechanical process. When engravers and methods could not be found for illustrating his medical botany, he himself became inventor, and produced the method of *aqua-tinting* colors, a method which no doubt "would have passed into profitable use had not the invention of lithography soon afterwards superseded its employment." The results of his labors as Rumford Professor culminated in his exhaustive "Elements of Technology," which appeared in 1829.

But there was in practice another important error upon the overturning of which Dr. Bigelow concentrated the whole weight of his ability and influence—the existing practice of restricting education to ancient languages and to metaphysics. In the energetic stand which he took in this generous cause he excited immediate antagonism, and was often charged with bearing no sympathy for the languages, a thrust most wantonly false, for none knew them better than he, and few used them more skilfully. He objected to the time they usurped in the college courses, however, and his writings and addresses did much to institute a reform. He wrote two important essays upon this topic, "The Limits of Education," in 1865, and "On Classical and Utilitarian Studies," in 1866. This latter is said to be "the longest, the most elaborate and the most learned of his written productions."

Jacob Bigelow will ever be best and widest known, however,

through his efforts in establishing and perfecting the beautiful Mt. Auburn cemetery. He was the first in the world to conceive and to perfect plans for applying the appropriate art of landscape gardening to the adornment of the "city of the dead." From his first public effort in 1825, through the seven years in which he persistently urged the adoption of his plans, and during the half century which followed, he had the satisfaction of being known as the originator and strongest advocate of an art which he lived to see world-wide in its practice. When others took no interest in his measures, he himself became architect and gardener, and attended to all the details of the undertaking. One of his last labors was to devise a mammoth sphinx, which was sculptured in stone and presented to the cemetery as a monument to the soldiers who perished in the war. Ere the monument was placed on its site its venerable projector had been wholly deprived of vision, but with others' help he was raised slowly and enabled to pass his hands over the whole structure, that he might "see it by feeling." He compiled a little book descriptive of the monument, and sketching the propriety of transferring the emblem from Egypt to America. He also wrote an attractive volume giving a detailed history of the cemetery.

Dr. Bigelow had the highest appreciation of the beautiful in nature and the meritorious in literature and art. Always in love with nature, he named the walks and paths of Mt. Auburn after plants and flowers. Nothing could more fitly preserve his memory than its association with the vegetable world through the genus Bigelovia, which De Candolle bestowed, in 1836, upon some golden-flowered Compositæ. More than thirty American species have since been referred to this genus.

Dr. Bigelow early took to poetry, and at intervals during his life he wrote poems in English, Latin and Greek. A volume of his collected poems was anonymously published under the name of "Eolopœsis, American Rejected Addresses." When at last he became infirm and was confined to his room, he amused himself by translating into Greek and Latin verse the Mother Goose melodies, which he published under the title of "Chenodia." Toward the close of his life the bright intellect became dimmed, the lamp burned low, and on the 10th of January, 1879, in his ninety-second year, the last ember expired.—L. H. Bailey, Jr.

A New Phallus.

(PLATE IV.)

During the month of October, last year, I found, growing in a somewhat shady, grassy spot in the vicinity of Bethlehem, a group of three large specimens of a *Phallus* having a rather unusual appearance. Owing to the perishable nature of these fungi and the unsatisfactory method of preparing them for herbarium specimens, I determined to retain their important characters by means of a photograph. Accordingly a negative was taken of an entire specimen, representing the external appearance, and, by its side, a longitudinal section of another; the resulting photograph was very satisfactory, being five-sevenths of the size of the specimens.[1] In order to have the species identified I sent photographs with notes to our leading American mycologists, who were finally unanimous in pronouncing it most nearly allied to *Phallus Dæmonum*, Rumph., yet were doubtful whether it was identical with that species. In order to arrive at a satisfactory conclusion, I sent a photograph to Rev. C. Kalchbrenner, Hungary, who, in reply, stated that the very ample trumpet-shaped veil and small meshes are characters of sufficient importance to distinguish it as a new species, though he also recommended further careful examination of living specimens, in order more accurately to determine the distinctive characters of the species. The plants had a very disagreeable odor, equally as offensive as *P. impudicus*, Linn., which also occurs here. The spores are oval 1.5-2x3-4 mm. It differs from *P. indusiatus*, Schl., in having smaller meshes to the veil, besides that species is said to be odorless. I herewith present the diagnosis of the new species as drawn up by Rev. C. Kalchbrenner:

PHALLUS (HYMENOPHALLUS) TOGATUS, Kalchbrenner, n. sp. Volva crassa, subglobosa basi parumper applanata radiculis quibusdam laxe anastomosantibus aucta, superne in lobos irregulares rumpens, flava. Stipes subventricoso-cylindricus, apicem versus attenuatus, 5 6 poll. longus, pollicem crassus interstitiis irregulariter sparsis lacunosus, albus. Velum tubæforme ultra medium pedunculis dependens (conicum i. e. lateribus in limbo extrorsum curvatis) margine integerrimo interstitiis parvis, subrotundis, album. Pileo ovato-acuminato, anguste parvio, margine membrana plicatula adpressa aucta profunde scrobiculato-reticulato,

[1] The figures of the plate are the same size as those of the photograph.

olivaceo.—In locis graminosis, circa Lehigh University, Bethlehem, Pa. E. A. Rau, Oct. 24, 1882.

The photographs of this new *Phallus* were made by Dr. C. L. Lochman, Bethlehem, who has for several years past made excellent photographs of a number of the most important indigenous and exotic medicinal plants.—EUGENE A. RAU, *Bethlehem, Pa.*

Notes on Fresh-Water Algæ.

In relation to species of Algæ which produce what the Germans call "wasser-blüthe," or, in less poetical English, a scum on the surface of bodies of water which serve as water-supplies, there has of late been felt a great interest on the part of the public, and in this connection I would call attention to some interesting forms found in Minnesota last summer by Prof. J. C. Arthur. The two scum plants, so common in the Eastern States, *Clathrocystis æruginosa*, Henfrey, and *Cœlosphærium Kuetzingianum*, Näg , appear to be also common in the West and were found by Prof. Arthur in Lake Satakah and Lake Tetonka, at Waterville, Minn.; and the first-named species was also found by Prof. Wm. Trelease in Lake Mendota, Wis. Consequently, as the West becomes more thickly settled we may expect to hear of the same disagreeable pig-pen odor which is found in Eastern water-supplies during hot summers.

Prof. Arthur also detected an interesting alga floating on Lake Tetonka, Waterville, and Lake Phalen, near St. Paul, which has not as yet been found in Eastern water-supplies. The alga in question resembles *Rivularia atra*, Roth, but is of softer consistency and the filaments have a different micrometric measurement. The species of *Rivularia* grow attached to other plants, sticks, stones, etc., and although they at length become free, they are then found resting loosely on the bottom and not forming a scum on the surface of the water. In *Hedwigia*, Jan., 1878, Cohn described a *Rivularia* which he called *R. fluitans*, which formed a "wasser-blüthe" on the river Leba, near Lauenberg, in Pomerania; and in *Hedwigia*, March, 1878, Gohi mentioned the occurence of a similar *Rivularia* at Udrias, on the Gulf of Finland, to which he gave the name of *R. flos-aquæ;* but in *Hedwigia*, April, 1878, he stated that his plant was of the same species as that of Cohn. The *Rivularia* collected by Prof. Arthur in all essential respects seemed to me to be the same species

as that collected by Cohn and Gohi, and on sending a specimen to the last-named botanist he confirmed the correctness of the diagnosis.

Mixed with the Minnesota Algæ named above were fragments of an *Anabæna*, which appeared to be the form commonly known as *A. Flos-aquæ*, var. *circinalis*, and also traces of a larger *Anabæna*, the species of which could not be made out. In the Boston water works at South Framingham, Mass., *Anabæna gigantea*, Wood, was found in small quantity in the early part of November, 1882. I would also record the discovery of *Nostochopsis lobata*, Wood, by Messrs. E. Faxon and F. H. Hosford, at Ferrisburg, Vt., where it was comparatively abundant and formed expansions of several inches in water-courses. The occurrence of *Sphæroplæa annulina* should be recorded in California, where it was collected by Mrs. Austin near San Bernardino.—W. G. FARLOW.

General Conditions of Spontaneous Protoplasmic Movement.

Dr. Chas. S. Dolley, of Rochester, N. Y., has just translated Th. W. Engelmann's paper upon the "Physiology of Protoplasmic Motion," which has attracted so much attention. The following are the general statements under the above caption:

1. TEMPERATURE.—For all contractile protoplasm there is a higher and a lower temperature at which the spontaneous movements cease under all circumstances. The minimum lies mostly in the neighborhood of 0°, the maximum generally about 40°(C).

2. HYGROSCOPICITY.—In regard to this it is the same as regarding the temperature. There is, for all protoplasm, a maximum and minimum capacity for the inhibition of water. Close determination is wanting, yet the minimum may average below 60 per cent., and the maximum over 90 per cent. Within these limits the energy of the movements increases in general with the amount of contained water, with a corresponding increase of volume, and diminution of the refractive coefficient. Rapid change in concentration of the medium, causing rapid swelling, or more specially shriveling, acts in a manner similar to irritants.

3. OXYGEN.—Protoplasmic motion is undoubtedly able to continue in a medium entirely free from oxygen, but for a short time only, at the most, some hours. The gradual stagnation can at first be overcome by the introduction of oxygen, and by this means alone.

GENERAL NOTES.

Fern Distribution in the U. S.—Mr. Geo. Davenport has read before the *Am. Phil. Soc.* a paper containing some comparative tables showing the distribution of ferns in the United States. This is in anticipation of the publication of a Text Book and Manual of the Ferns of North America, for which these tables were prepared. Some notes upon them will be of interest to all. Up to the date of publication (Feb. 2, 1883), the entire fern flora of the U. S. contained 162 or 164 known species. Of the States, New York leads with 52 species, followed by California with 48, Florida and Michigan with 47 each, Arizona with a probable 47, and Vermont with 45. Mr. Davenport thinks that owing to the contiguous unexplored Mexican territory, Arizona will lead all the other States in the wealth of her fern flóra. The only other States containing 40 or more species are, Pennsylvania (42), Kentucky (41), Arkansas (41), and Connecticut (40). *Pteris aquilina, Adiantum pedatum, Cystopteris fragilis,* and *Asplenium Trichomanes* are probably the most cosmopolitan, and *Polypodium vulgare* has almost as great a range. Florida is distinguished in monopolizing all the species we have in six genera; these, of course, being tropical. The only other State which has the monopoly of a genus is New Jersey with its very local *Schizæa.* Only recently the discovery of *Scolopendrium* in Tennessee divided the honor of its presence with New York.—J. M. C.

Castor Oil Wood.—Soon after the completion of the University plant houses last spring, there were planted in the large central bed of the palm-house, for want of something more desirable, a number of different kinds of *Ricinus.* These were allowed to grow for seven months, when they were cut down to make room for other plants. At this time all of the twelve kinds were above fifteen feet in height, while the largest, the seeds of which had been received under the name of *Ricinus Africanus,* was eighteen feet in height, with a trunk fully ten inches in circumference at the base. Noticing the woody character of these trunks, which, for the first two or three lower joints, were unexpectedly solid and firm, with scarcely a trace of pith, some of them were seasoned, and have since been worked up. The wood is of light color, closely resembling basswood in appearance, but without any trace of concentric rings indicating periodic growth. Under the microscope the wood-cells are found to be of large size, with very numerous dotted ducts intermixed, while the medullary system is unusually well developed. To determine the character of the wood, some comparisons with other kinds have been made. Weight of a cubic inch of completely dried wood in grams: Red oak, 8.82; butternut, 7.12; sugar-maple, 11.21; white pine, 6.22; Ricinus, 4.53. Weight in grams of water absorbed by each block when immersed for several days: Red oak, 8.77; butternut, 7.78; sugar-maple, 8.22; white pine, 6.43; Ricinus, 14.44. Percentage of ash: Red oak, 0.26; butternut, 0.51; sugar-maple, 0.46; white pine, 0.11; Ricinus, 2.20. Specific gravity: Red oak, 0.5385; butternut, 0.4347; sugar-maple, 0.6843; white pine, 0.3797; Ricinus, 0.2766. In *Forestry Bulletin,* No. 22,

two kinds of wood are mentioned which have a lower specific gravity than Ricinus, namely, *Salix discolor*, 0.2259, and *Yucca baccata*, 0.2724. It seems worthy of note that a solid trunk of wood, three inches in diameter, even of no better quality than this, was grown from the seed in seven months.—A. N. PRENTISS, *Cornell University.*

The Shapes of Leaves.—Following is a résumé of a series of papers in *Nature* on the above topic, by Prof. Grant Allen. Like his other recent contributions to evolutionary botany, they contain the result of much careful observation and clever reasoning; and while we can not give assent to all his positions, we welcome the essays because they can not fail to stimulate inquiry in this much-neglected field.

I. *General Principles.*—The leaf is the essential and really active part of the vegetable organism. Its chief function is the absorption of carbonic dioxide from the air, and its deoxidation under the influence of sunlight. Two main conditions affect the shape and size of leaves: first, the nature and amount of the supply of CO_2; and second, the nature and amount of the supply of sunshine. There is a great struggle among plants for the CO_2 of the air, and through natural selection each plant tends to have its chlorophyll disposed in the most economical way for catching such sunlight as it can secure, and its absorbent surface so disposed as to catch such particles of carbon as pass its way. Each plant inherits a general type of foliage from its ancestors, and modifies it to suit the exigencies of its altered conditions. The actual shape is not always the ideally-best shape for those conditions, but it is the best possible adaptive modification of a pre-existing hereditary type. The venation tends most generally to reproduce itself under all varieties of external configuration. This venation is a fixed generic or tribal characteristic, and with very slight structural modifications we find great differences in the resulting outline. *Ranunculus aquatilis* has two forms of leaves, those floating on the surface full and rounded, the lower ones, like all submerged leaves, becoming minutely subdivided into long, almost hair-like filaments, in this simulating the streaming *Algæ* and *Characeæ*. Both forms of leaf preserve the ranunculaceous type in their venation.

II. *Extreme and Intermediate Types.*—Where access to sunlight and CO_2 is unimpeded in all directions the leaves tend to assume a completely rounded form. This condition is most common on the surface of the water, hence most water plants with floating leaves take this shape, e. g., *Lemna*, *Nelumbium* and *Nymphæa*. Occasionally this freedom is found among land plants, e. g., *Podophyllum*, *Tropæolum majus*, and *Hydrocotyle*. The common weedy plants, especially the annuals and non-bulbous perennials, which, growing thickly together, can not afford material to push broad leaves above their neighbors' heads, and are therefore compelled to fight among themselves for every passing particle of carbon, have their leaves very minutely subdivided, e. g., the *Umbelliferæ*. The whorling of linear leaves occasionally serves the same purpose as minute segmentation. Sometimes plants with ovoid leaves in a rosette insure them-

selves a good supply of carbon by keeping under all competitors by their close tufts, e. g., *Plantago major*.

III. *Origin of Types.*—There are two ways, according to Herbert Spencer, in which a stem may be developed from stalkless creeping fronds: first, by the inrolling or folding of the fronds forming a tube with adnate edges and resulting in the endogenous stem and monocotyledonous embryo; second, by the thickening and hardening of a fixed series of midribs, resulting in an exogenous stem and dicotyledonous embryo. Monocotyledonous leaves tend to show little distinction between blade and petiole, to assume a lanceolate or linear shape and parallel venation, because the fibro-vascular bundles will tend to run continuously over every part, since the leaves are mere prolongations of the stem-forming portion, and because this venation is most convenient for long, narrow leaves. Of dicotyledonous leaves the opposites are true. The central type of leaf among monocotyls is long, narrow and rather fleshy; among dicotyls, simple, ovate and nearly ribless, or with faint digitate venation. Pinnate venation replaced palmate whenever circumstances caused leaves to lengthen faster than they broadened, the main ribs then being given off, not from the same point, but a little in front of one another. Pinnate ribs seem especially adapted to forest trees, probably protecting them against storms. The shapes of leaves thus depend upon two factors: first, the ancestrally inherited peculiarities of type and venation; second, the actual conditions to which the species is habitually exposed.

IV. *Special Types.*—Sessile leaves are particularly apt to be lanceolate. Decurrent leaves show the traces of the primitive unity of stem and leaf. Radical leaves, with long foot-stalks, will commonly be orbicular cordate and are most frequently produced from perennials with richly-stored root-stocks. The shapes of the leaves of climbers and trees have reference only to exposure to sunlight. Unequal exposure causes them to become oblique, e. g., *Begonia* and *Tilia*. Growth in dry soil and proximity to the sea, whether the plant grow in sand or mud, both tend to produce succulence. C. R. B.

EDITORIAL NOTES.

The Report of the Botanical Section of the Acad. Nat. Sci., Philad., for 1882, makes a good showing for the Herbarium, no less than 3,346 species having been added, one-third of which were new to the collection, and 100 of the genera not before represented. This is the largest annual addition since the organization of the Section, and is chiefly due to the zeal and liberality of Messrs. Redfield, Canby, Parker, Martindale, Meehan and others. Dr. Gray supplied more than 1,000 species, and Prof. Sargent furnished choice herbarium specimens of some of our rarer trees and shrubs. All this has thrown much labor on the Conservator, Mr. John H. Redfield, who has been ably assisted by the Philadelphia botanists above mentioned.

PROF. C. E. BESSEY, in the May *Naturalist*, very sensibly calls the attention of the Department of Agriculture to the subject of the parasitic fungi. Much money has been wisely expended by the government in the investigation of noxious insects, while no such provision has been made for the study of parasitic fungi, from the ravages of which there is an annual loss to our crops of millions of dollars. The rust, the smuts, and their allies ought to be thoroughly studied, and the government could do no wiser thing than to supply the Department of Agriculture with the means for carrying on such investigations.

IT SEEMS AS IF we we will have to give up the old idea that the growing point of phanerogams is a group of cells, as opposed to cryptogams with apical cell, for Dingler announces the discovery of an apical cell in the stems of seedling gymnosperms. And so phanerogams and cryptogams are gradually blending together, and paleontology and the microscope have caused to vanish our once "hard and fast line."

THE JOURNAL OF BOTANY for April contains a list of the new genera and species of phanerogams published in periodicals in Britain in 1882. The list is a formidable one, containing 16 new genera and 357 species, mostly from Asia, South America and Madagascar. This surely indicates wonderful activity, both in the field and in the herbarium.

THE STARCH GRAINS of seeds, especially of the bean and pea in which they are quite large, are almost always cracked by the loss of water in drying, the cracks radiating from the nucleus, because the interior layers contain proportionally more water. That the above statements are true may be easily demonstrated experimentally in the following way: Dry some fresh potato starch (which previous examination has shown to be sound) over a water-bath at a temperature of about 60° C. On re-examining the grains they will be found cracked radially. By treatment with absolute alcohol the process of cracking may be watched. Scrape the surface of a fresh-cut potato and dry the scrapings on blotting paper. Transfer to a slide and cover with 100 p.c. alcohol. In a few minutes the fissuring will begin, the first one always transverse to the long axis of the grain, or at right angles to the line of greatest contraction.

THE ROYAL GARDENS, at Kew, England, through the wise management of their officers and the liberal financial support which they receive, have become the center for the botanical and horticultural interests of the British Empire. The Report for 1881 shows something of the large amount of very varied and useful work which was carried on in and through them during that year. The Report contains reports from the Colonies and accounts of the progress of experiments in the culture of important economical plants, such as India rubber, Cinchona and Coffee.

WHAT HAVE BEEN called, by a stretching of the term, non-calcareous cystoliths, have been detected by H. Molisch in the pith of *Goldfussia isophylla*, *G. glomerata* and *Ruellia ochroleuca*. They occupy the interior of polyhedral or cylindrical sclerenchymatous cells which are scattered among the parenchyma. These "cystoliths" resemble the normal ones in the same plant in form, but

differ from all previously described ones in being attached to the cell-wall by several pedicels and in the absence of calcium carbonate. Their reactions indicate that they are composed of slightly lignified cellulose.

F. Ludwig calls attention in *Kosmos* to the flower of one of the Aroideæ (*Philodendron bipinnatifidum*), whose structure is such as to fit it for fertilization by snails, which, attracted by a strong nutmeg odor, creep into the spathe and crawl about over the flowers. The snail is certainly the last animal to be suspected of any connection with the cross-fertilization of flowers. What next?

The meeting of the American Association of Science at Minneapolis next August will give an admirable opportunity for botanists to become acquainted with an interesting flora. Probably the first plant to attract attention upon arriving in the city is the northern wormwood, *Artemisia frigida*, with delicate whitened foliage clothing the rocks and banks below the Falls of St. Anthony. The other flowering plants meriting attention are numerous. The region is also rich in *Characeæ* and other fresh-water algæ, especially *Nostocaceæ* and *Desmideæ*. The long excursions will doubtless go into districts of still more unfamiliar vegetation. The meeting should command a larger attendance of botanical students and collectors than heretofore.

The theories in regard to the structure and growth of the cell-wall are having a thorough overhauling at the hands of German histologists. A *résumé* of Prof. Strasburger's last work, in which he criticises the generally-received Nægelian hypothesis, has already been given (vide, p. 172, this volume). In addition, now comes F. Schmitz, who adduces further arguments from the structure of the cell-wall in the filamentous algæ, in support of his view that the growth of the cell-wall in surface as well as in thickness is due to apposition and not to intussusception. Von Höhnel, after examining the wall of bast-fibers and other cells, comes to the conclusion that the wall is not composed of crystalline micellæ. All the phenomena exhibited by cell-walls with polarized light he believes can be explained by a simpler theory, and one which also explains some phenomena of swelling up of the wall not hitherto explicable on the micellar hypothesis. (See *Bot. Zeit.* XL, pp. 595 and 616, for an account of his theory of molecular tensions.) While the discussion is thus running it will be well for teachers and lecturers to hold lightly to the Nægelian theory of micellæ at least, and possibly also to that of intussusceptive growth.

It seems that the effect of free oxygen upon quiescent bacteria is so great that the presence of the trillionth of a milligram of the gas can be detected by their movements; and this fact is being applied in the study of the work of assimilation in relation to various colors, one result of which is to show that there must be a series of colors other than that of chlorophyll which possess the power of assimilation.

It is not considered good taste to apologize for one's own appearance, but the April Gazette must be our excuse. We are to be congratulated that it made its appearance in any shape, for it fell into most incompetent hands. Having now contracted with a firm conceded to do the best work in the State, it is

expected that hereafter there will be nothing to offend the eye of the most fastidious.

PROF. J. E. TODD, of Beloit, Wis., observes that in *Psoralea argophylla* a joint is formed in the stem very near the top of the ground, as perfect as that separating a leaf from the stem. "It cuts through all the tissues so that when the top dries up and begins to sway in the wind, it is broken off very readily or evenly." Thus they are rolled across the prairie and their seeds are disseminated.

MR. THOS. H. CORRY has been studying the development and mode of fertilization of the flowers of *Asclepias Cornuti* and has made some important additions to the work done by R. Brown, Payer, Schacht, and others. He shows that the so-called "stigma-disk" is formed by the fusion of the two style-apices, and not by that of the two stigmas. The anther wings, he finds, originate as lateral processes of the connective. In the matter of pollen formation the genus presents a "perfectly unique, isolated, and peculiar case of formation." These and many other results were announced recently to the Linnean Society of London.

MR. J. G. BAKER has presented to the Linnean Society of London the second part of his "Contributions to the Flora of Madagascar," in which are descriptions of 160 new *Gamopetalæ*. A new genus is described allied to *Cinchona*. Several new genera of *Acanthaceæ* are described, among which is *Monachochlamys*, so named because each one of the numerous flowers is contained in a persistent spathaceous bract, like the hood of a Franciscan monk.

THE SHORT PAPER by Dr. A. L. Childs in the *Popular Science Monthly* for December, 1882, (vide BOT. GAZ., this volume, page 163), has called out a vigorous rejoinder from Mr. J. B. Strawn, C. E. Mr. Strawn, referring to the well-known fact that surveyors were in the habit of "blazing" trees on lines and at corners, says that, having had occasion many times to chop into such trees to satisfy himself of their identity, he has in every instance found the number of rings to correspond with the number of years which had elapsed since the blazing was done. The rings found by Dr. Childs he suspects to be those formed by trees when, from drought or some similar cause, the wood ceases to grow, but afterward, on account of copious rains and a high temperature, is forced into a second growth. Mr. Strawn also affirms that examination of trees of his own planting confirms him in the belief that the truthfulness of the "ring-record" may be depended upon.

CURRENT LITERATURE.

The Mycologic Flora of the Miami Valley, Ohio. By A. P. Morgan. From Jour. Cin. Soc. Nat. Hist. vol. vi., April, 1883.

Mr. Morgan has long been studying Fungi, and the above is a part of the result of his study in the Miami Valley. It is a most commendable effort to put the descriptions of these low forms of plant life within the reach of the many,

for it would be hard to accumulate too much knowledge of the so-called Fungi. The pamphlet before us is devoted to the *Leucospori* under the immense genus *Agaricus*, and the species number just 80. Four good plates illustrate six new species, all of Mr. Morgan's describing except the *A. Morgani* of Mr. Peck. The species are arranged according to the *Hymenomycetes Europæi* of Elias Fries, whose classical descriptions are also carefully translated, the local variations and general observations being appended in the form of remarks, which are very interesting. Lea's catalogue is the only other one covering this region, and his 34 *Leucospori* have been increased to 80 by Mr. Morgan, 5 of which he has described as new species, and 12 bear Mr. Peck's name as author. The second paper will be devoted to the remaining *Agarici*.

Tables for the use of Students and Beginners in Vegetable Histology. By D. P. Penhallow, B. S. Boston. S. E. Cassino. 1882.

This little book of some 40 pages is printed and bound in a most elaborate way, the large type, broad pages, and stiff back, fitting it more for the library than the laboratory. It is hardly fairly named, as it deals only with the microchemistry of plants, and by no means presents the broad principles of vegetable histology. It could be made useful under an efficient teacher, but then it would hardly be needed; but for an unskilled teacher, or one who is attempting self-instruction, it seems hardly the thing. There is given a list of reagents, but with nothing practical as to their preparation or application. Then follows an account of the common "vegetable products," under which, among others, we find grouped protoplasm, the nucleus, and silica. A better heading would have been "cell-contents," which is used for Table I. The second table is devoted to "Cellulose Forms," by which is meant the form and structure of cells; and Table III. is headed "Plant Products," which by no means includes all the "vegetable products" mentioned in the text under that caption. In fact, to the casual reader, it would seem rather difficult to draw the line between "cell-contents" and "plant products," although a table is devoted to each. The conception of the work is excellent, but the execution seems very imperfect.

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BAKER, J. G.—A Synopsis of the Genus Selaginella, continued (containing descriptions of 10 new species, all from S. Am.), *Jour. Bot.* 21. 97.

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